that have occurred throughout much of the range of the Northern Spotted Owl often use differing classifications of habitat types. A strong recurring pattern is evident, however. When old growth is classified as a separate habitat type, it is consistently used more than expected. Early seres receive little use and are consistently used less than expected. Mid-seral and mature forest receive ambiguous use: there are relatively few instances of use in excess of availability, but proportionate use appears to increase with successional development/age. A number of observations of Northern Spotted Owls associated with young or managed forest stands have been noted. An example is given for habitat use and selection within a landscape dominated by structurally complex intermediate aged forest and partial-cut older forest. The use of broad seral stages did not differ from the general pattern found in other studies. Compared to unentered old growth, proportionate use was markedly reduced in relatively light partial cuts (salvage) 25 years after entry. Stands in which partial cutting removed 30–40% or more of basal area received little use 10–20 years after entry were consistently used less than expected. We also discuss the need to link habitat use to population response in order to infer habitat quality or suitability.

ASSOCIATIONS BETWEEN PREY ABUNDANCE, FOREST STRUCTURE, AND HABITAT USE PATTERNS OF SPOTTED OWLS IN CALIFORNIA

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At least 6 hypotheses have been proposed to explain the association between spotted owls (*Strix occidentalis*) and old-growth forests. Here we will address the hypothesis that selection of older forests by spotted owls is related to higher prey abundance in these habitats. Woodrats (*Neotoma* spp.) are the dominant prey of northern spotted owls (*S. o. caurina*) in the Klamath Province of northwestern California. The abundance of dusky-footed woodrats (*N. fuscipes*) was estimated to determine which habitats supported the highest densities. Woodrats averaged over 80 animals/ha in sapling/brushy pole timber stands and <1 woodrat/ha in all other seral stages. Sapling/brushy pole timber stands were seldom used by foraging spotted owls despite the high densities of woodrats that occurred there. However, these stands may be source areas for woodrats that subsequently disperse or move through older stands where spotted owls forage. Several radio-tagged woodrats moved short distances (<52 m) from their nest sites in sapling/pole timber stands into adjacent old-growth stands at night, then subsequently returned to their nests. In a previous study, woodrats were reported to be significantly more abundant at edges of older stands and sapling/brushy stands than in old conifer stands with a hardwood understory or old conifer stands with poor understory development. We examined use of habitat edges by owls by comparing the distribution of distances from edges between owl foraging locations and random locations. Where owls preyed predominantly on woodrats, they foraged significantly closer to edges than expected by chance. Where owls preyed predominantly on flying squirrels, use of edges was not different from random locations. Northern flying squirrels (*Glaucomys sabrinus*) are the primary prey of California spotted owls (*S. o. occidentalis*) on the Lassen National Forest (NF) in northeastern California. Spotted owls on the Lassen NF foraged infrequently in stands that had been shelterwood-logged and undergone intensive site preparation, and they used stands with large-diameter trees and dense canopy cover more than their availability. We tested the hypothesis that flying squirrel density was less in shelterwood-logged and second-growth fir (*Abies* spp.) stands than in nearby old-growth fir stands. Mean flying squirrel density was significantly less in shelterwood-logged than in old-growth and second-growth stands Although squirrel density did not differ significantly between old-growth and second-growth stands, mean density was 40% greater in old-growth than in second-growth stands. Spores of hypogeous fungi sporocarps (truffles) and arboreal lichens were the most frequently observed food types in flying squirrel stomach and fecal samples. We sampled truffles on each grid that was trapped for flying squirrels. Truffle availability (proportion of sample plots on which truffles were found) was significantly correlated with flying squirrel density. Fungus composition varied among the 3 stand types, and more genera were found in old- and second-growth stands than in shelterwood-logged stands. Arboreal lichens were more abundant in old-growth than in second-growth stands. Other habitat variables such as potential nest-site availability and understory cover were less closely associated with flying squirrel density. These data indicate that flying squirrel density was associated with forest structure, and that variation in availability of truffles and lichens explained much of this association The hypothesis that spotted owls select older forests for foraging because prey abundance is higher in these habitats is not supported by data from woodrats, at least for California forests. Woodrats were most abundant in sapling/pole timber stands. These results suggest that where spotted owls in California forests prey on woodrats, they infrequently use younger stands for reasons other than low prey abundance. As suggested elsewhere, high tree densities and homogeneous canopies in second-growth forests may reduce flight maneuverability and the ability of owls to capture prey. However, where woodrats are the dominant prey of spotted owls, silvicultural procedures that maintain or enhance woodrat populations adjacent to suitable spotted owl habitat may benefit spotted owls. This hypothesis needs to be tested. Flying squirrel density patterns were consistent with spotted owl habitat use patterns, at least between shelterwood-logged and old-growth fir stands. Results were less clear for even-aged second-growth stands. Because such stands are rare on the landscape, we were unable to adequately examine how frequently they are used by spotted owls. Flying squirrel density was greater in old-growth than in second-growth stands, but density varied greatly among stands. This problem needs further research.

Burrowing Owl Symposium

Organizer: Jeffrey L. Lincer, *Biosystems Analysis, Inc., 13220 Evening Creek Drive South, Suite 119, San Diego, CA 92128*

Ecology of the Burrowing Owl in Pampean Agrosystems of Argentina

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A general approach to the ecology of Burrowing Owls in Pampean agrosystems of Argentina was made: 1) to record basic information on habitat use, food habits, hunting habitat, differential predation on rodents, feeding strategy, mortality factors, and breeding biology; 2) to examine the reproductive success and needs of conservation; and 3) to examine regulatory effects on rodent populations. The Burrowing Owl is the most abundant owl in Pampean agrosystems. It is a generalist predator and its diet strongly depends on the availability of alternative prey. Borders of cultivated fields are the most common hunting habitats, where they showed differential predation on rodent species. The Burrowing Owl showed a sigmoidal functional response to the abundance of rodent populations; and this might contribute to the biological control of rodents in Pampean agrosystems. Nests are built in areas with relatively low disturbance. Mean clutch size was 4.8 ± 1.2 eggs, mean hatching per nest was 3.5 ± 2.4, and reproductive success was as low as 0.3 fledges per brood. Brood size affected growth of chicks. Main mortality factors of eggs were agricultural practices and predation, while illnesses and human predation were the main mortality factors of chicks. The low reproductive success may negatively influence the near future of Burrowing Owl populations in Pampean agrosystems. More studies should be done to provide more information (especially on mortality factors and population dynamics) before considering possible strategies for management and conservation.

The Burrowing Owl in the Americas: Its Taxonomy and Historical Distribution

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The Burrowing Owl was originally placed in the Genus *Strix* (1782) and then placed in the Genus *Athene* (1822) followed by being separated into a monotypic Genus *Speotyto* in 1842. It was later again included within *Athene* (1967–88) and again suggested as being properly placed in the monotypic Genus *Speotyto* in 1990. Evidences for these recommendations are reviewed. There are 18 commonly recognized geographic races of *Athene cunicularia* with two races having become extinct in historical times The geographic distribution of these races is also reviewed The above discussions are based on the literature, and an extensive bibliography is presented.

Results of the 1991 Census of Burrowing Owls in Central California: An Alarmingly Small and Declining Population

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The Institute for Bird Populations, with the help of volunteers from 13 local Audubon Society chapters and ornithological organizations, conducted a census of Burrowing Owls in the San Francisco Bay Area and the central part of California's Central Valley during the period May 15–June 30, 1991. A random stratified sample of 198 of the 1792 5-km by 5-km UTM blocks in this 43 425-km^2 census area, along with 82 additional blocks that were not randomly chosen but were thought to contain breeding owls sometime during the preceding decade, were censused. A total of 328 pairs of owls was found at a total of 264 breeding locations in 73 blocks. These data suggest that the total breeding population of Burrowing Owls in the census area may be as low as 925 pairs, and that up to 69.4% of the 504 previously suspected breeding pairs and 65.6% of the 355 previously suspected breeding locations may have disappeared during the past decade. The data also suggest that the disappearance rate was greater in the Bay Area than in the Central Valley, and that the disappearance rate in both regions, but especially in the Central Valley, is accelerating. Loss of breeding habitat appears to be one major cause for this pronounced population decline. The fact that the number of breeding pairs per breeding location also appears to be declining, particularly in the Central Valley, suggests that other factors may also be contributing to the decline. We suggest that unless concerted efforts to reverse this population decline are initiated quickly, Burrowing Owls may be extirpated from central California within about 50 years. Possible errors in these results, and methods for determining the extent of these errors in the 1992 and 1993 censuses, are discussed.

Site Fidelity in Burrowing Owls

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An effort to dislocate a pair of Burrowing Owls in San Joaquin County, California from a development site during the early winter of 1991–92 and subsequent monitor-